SUBJECT INDEX (Vol. 54)

Adaptive control
  hybrid, practical, taking into consideration computational time, 279
  long-range, with input constraints, 289
Adaptive expert control, 867
Affine non-linear systems, robust decoupling, characterization of allowable perturbations, 729
Algorithmic aspects of multiple models, multiplicative noise and linear quadratic control, 921
Algorithms
  for internal model principle based adaptive control, unified treatment, 883
  parallel, for algebraic Riccati equations, 1317
Almost periodic weakly non-linear systems, asymptotic analysis, 561
ARX model, recursively identified, frequency domain accuracy, 465
Asymptotic analysis of almost periodic weakly non-linear systems, 561

Bibliography, annotated, of secondary sources for the history of control engineering, 517

Chandrasekhar filter, square-root type, systolic array implementation, 1385
Compensator
  for special class of non-linear systems, numerical synthesis, 215
  non-linear, dynamical, for d.c.-to-d.c. power converters, differential algebraic design approach, 111
  observer-based, frequency-domain design, discrete-time case, 705
Computation of time-optimal controls applied to rigid manipulators with friction, 1097
Controllability, multivariable, decentralized, integral, 481
Controller
  digital, robust, synthesis for multivariable open-loop stable or unstable processes, internal model control, 665
  fast, parallel, self-tuning, 1353
  fuzzy, adaptive expert control, 867
  optimal, with both deterministic and stochastic signals present in feedback system, 943
  reduction in the two-block H^∞-optimal design for distributed plants, 1291
  robust, long-range, adaptive incorporating soft input constraints, 289
  structures, digital, for fine- and medium-grain parallel processing architectures, 1413
  synthesis, necessary conditions for optimal disturbance rejection in linear systems, 999

Decoupling, robust, of affine non-linear systems, characterization of allowable perturbations, 729
Delta operators for robust discrete-time systems, 453
Descriptor systems, two-point boundary-value type, reachability, observability, minimality and extendibility, 635
Design
  H^∞-optimal, two-block, for distributed plants, controller reduction, 1291
  non-linear dynamical compensator for d.c.-to-d.c. power converters, differential algebraic approach, 111
  observer-based compensators in the frequency domain, the discrete-time case, 705
  robust electrical position servo based on dual model matching, 497
Digital controller structures for fine- and medium-grain parallel processing architectures, 1413
Discrete balanced stochastic truncation, relative-error bound, 593
Discrete-event systems
  concurrent, supervisory, control, 1143
  non-deterministic, closed model derivation by output feedback control, 903
Discrete-time gaussian reciprocal processes, smoother implementations, 1233
Discrete-time $\mathscr{H}_\infty$ control, state-space approach 1031
Discrete-time systems, linear, periodic, robust tracking and regulation, 613
Distributed plants, two-block H^∞-optimal design controller reduction, 1291
Disturbance rejection, optimal, in linear systems, necessary conditions, 999
Dithered feedback systems, extensions, 83

Eigenstructure assignment, robust, for multi-input systems, 1273
Equalizer principle of $\mathscr{H}^\infty$-optimal control, application to super-optimization, 393
Expert control, adaptive, 867

Feedback system, linear, multivariable, uncertainty and interaction, 849
Feedback
  dithered systems extensions, 83
  high-speed, real-time, mapping systolic structures onto transputer/A100 based parallel processors for adaptive/self-tuning control, 1401
  of output, asymptotic behaviour, for class of non-deterministic discrete event systems, 903
Filter, square-root Chandrasekhar type, 1385
Flexible structure, non-linearly damped, frequency response, 135
Frequency domain accuracy of recursively identified ARX models, 465
Frequency response of non-linearly damped flexible structures, 135

Fuzzy control, hierarchical, 1201
Fuzzy controller, adaptive expert control, 867

Gain/phase margins for multivariable control systems with adjustable parameters, 435
Galois sequences, robust identification, 1189

$\mathscr{H}^\infty$ control, discrete-time, state-space approach, 1031
$\mathscr{H}^\infty$-optimal control, equalizer principle, application to super-optimization, 393
H_∞-type problems and quadratic games, for time-varying systems, 1249
Hierarchical fuzzy control, 1201
Hierarchical optimizing on-line control of large scale industrial processes, new coordination strategy, 1075
History of control engineering, an annotated bibliography of secondary sources, 517
Hopf bifurcation in an adaptive d.c. servo system, 831
Hough transform, application of simple object recognition by neural networks, 1471

Identification
  interpolation in H_∞, 1281
  of stabilizable systems, closed-loop approximation, 577
  rational, using an extended least-squares algorithm, 529
  robust and Galois sequences, 1189
  Individual channel design
  approach to multivariable control, 1
  of 2-input 2-output systems, structural issues, 47
Interconnected systems, robust control design, with time varying uncertainties, 1119
Interpolation in H_∞, robust identification, 1281

Least mean squares as a control system, 321
LQ control, optimal, parametric, robust, with guaranteed cost bound, 1309
LQ control problems, numerical solution for robust design, 921
LQ optimal control theory extension for mixed backgrounds, 943

Manipulator
  flexible, multi-link, sliding-mode control, 257
  rigid, with friction, computation of time-optimal control, 1097
MIMO self-tuning power system stabilizer, 815
MIMO systems, unified theory of impulse transmission, infinite zeros, and unbounded asymptotic behaviour, 307
Model predictive control, neural net based, 1453
Model reference deadbeat control, 1217
Model validity tests for non-linear signal processing applications, 157
MRAC robust control, modified scheme with enlarged class of unmodelled dynamics, 241
Multi-input systems, robust eigenstructure assignment, 1273
Multivariable control by 'individual channel design', 1
Multivariable control systems with adjustable parameters, gain/phase margins, 435
Multivariable decentralized integral controllability, 481
Multivariable gain margin, 337

Neural net based model predictive control, 1453
Neural networks
  for self-learning control systems, 1439
  simple object recognition, application of Hough transform, 1469
Non-linear discrete variable structure systems in quasi-sliding mode, 1171
Non-linear optimal control method: tracking and relative direction imbedded system, 417
Non-linear systems, special class, control method, 215

On-line hierarchical optimizing control of large scale industrial processes, new coordination strategy, 1075
Optimal control, non-linear, tracking and relative direction imbedded system, 417

Parallel processing, multidimensional binary partitions, distributed data structures for spatial partitioning, 1335
Parametric LQ control, robust, optimal, with guaranteed cost bound, applications, 1309
Partitioning, binary, multidimensional, distributed data structures for spatial partitioning, 1335
Pole assignment problem, structural investigation, 973
Power system stabilizer, MIMO, self-tuning, 815

Quadratic games and H_∞-type problems for time-varying systems, 1249
Quasi-sliding mode, non-linear discrete variable structure systems, 1171

Reachability, observability, minimality and extendibility for two-point boundary-value descriptor systems, 635
Reciprocal processes, discrete-time, gaussian, smoother implementations, 1233
Regulation, of linear periodic discrete-time systems, 613
Regulator, non-linear, infinite gain margins, 547
Riccati equations, algebraic, parallel algorithms, 1317
Robot
  dynamics, efficient, for high sampling rate motions, case studies and benchmarks, 793
  manipulator, computationally-effective recursive lagrangian dynamics formulation, 195

Robust control design for interconnected systems with time-varying uncertainties, 1119
Robust discrete time systems using delta operators, 453
Robust eigenstructure assignment for multi-input systems, 1273
Robust identification
and Galois sequences, 1189
and interpolation in H_∞, 1281
Robust MRAC control, modified scheme with enlarged class of unmodelled dynamics, 241
Robust optimal parametric LQ control with guaranteed cost bound, applications, 1309
Robust tracking and regulation of linear periodic discrete-time systems, 613

Servo, robust electrical position type, design based on dual model matching, 497
Servo system, adaptive, d.c., Hopf bifurcation, 831
Signal processing, validity tests, non-linear, model, 157
Sliding-mode control
multi-link flexible manipulators, 257
three-axis attitude control of rigid-body spacecraft with unknown dynamics parameters, 737
Spacecraft
flexible, modelled by planar motion of Timoshenko beam attached to rigid body, 763
rigid-body, with unknown dynamics parameters, three-axis attitude control, sliding-mode control system, 737
Stabilizable systems, identification, closed-loop approximation, 577
Stabilization, simultaneous, of linear single-input systems by linear state feedback control, 1015
Stabilizer, for power system, MIMO, self-tuning, 815
State-space approach to discrete-time $\mathscr{H}_\infty$ control, 1031
Stochastic truncation, discrete-time, balanced, relative error bound, 593
Supervisory control of concurrent discrete-event systems, 1143
Systolic array implementation of the square-root Chandrasekhar filter, 1385
Systolic structures, mapping onto transputer/A100 based parallel processors for adaptive/self-tuning control, 1399

Time-optimal control computation, applied to rigid manipulators with friction, 1097
Time-varying systems, quadratic games and H_∞-type problems, 1249
Timoshenko beam
attached to a rigid body, planar motion, boundary control, 763
structurally damped, with boundary inputs, semigroup model and stability, 367
Tracking, robust, of linear periodic discrete-time systems, 613

Uncertainties, time-varying, of interconnected systems, robust control design, 1119
Uncertainty and interaction of linear multivariable feedback systems, 849

Variable structure systems, non-linear, discrete, in quasi-sliding mode, 1171

Weakly non-linear almost periodic systems, asymptotic analysis, 561

AUTHOR INDEX (Vol. 54)

ADACHI, NORIHIKO, *see* Mitobe, Kazuhisa
ALLEN, T. G., *see* Cybenko, G.
AMINI, Z., *see* Lin, J.
ANDO, KAZUAKI, *see* Shin, Seiichi

BAHARIN, I. B., and GREEN, R. J., Computationally-effective recursive lagrangian formulation of manipulation dynamics, 195
BANKS, S. P., and HARRISON, R. F., Simple object recognition by neural networks: application of the Hough transform, 1469
BAR-ON, J. R., and JONCKHEERE, E. A., Multivariable gain margin, 337
BATUR, C., and KASPARIAN, V., Adaptive expert control, 867
BHAT, N., *see* Saint-Donat, J.
BILLINGS, S. A., and TAO, Q. H., Model validity tests for non-linear signal processing applications, 157
BILLINGS, S. A., and ZHU, Q. M., Rational model identification using an extended least-squares algorithm, 529
BISSELL, C. C., Secondary sources for the history of control engineering: an annotated bibliography, 517

CARRINGTON, C. K., *see* Long, T. W.
CHANG, CHE-HSU, *see* Tao, Chang-Shing
CHEN, B. S., *see* Lee, B. K.
CHEN, BOR-SEN, *see* Lee, Bore-Kuen
CHEN, Y. H., LEITMANN, G., and KAI, XIONG ZHONG, Robust control design for interconnected systems with time-varying uncertainties, 1119
CHEN, Y. P., and YEUNG, K. S., Sliding-mode control of multi-link flexible manipulators, 257
CHISCI, L., LEV-ARI, H., SLOCK, D. T. M., and KAILATH, T., Fast parallel self-tuning controllers, 1353
CHUN, J., and KAILATH, T., Systolic array implementation of the square-root Chandrasekhar filter, 1385
CREWS, M., *see* Kouvaritakis, B.
CYBENKO, G., and ALLEN, T. G., Multidimensional binary partitions: distributed data structures for spatial partitioning, 1335

DABIS, H. S., and MOIR, T. J., Least mean squares as a control system, 321
DE OLIVEIRA, M. C. F., and FLEMING, P. J., Digital controller structures for fine- and medium-grain parallel processing architectures, 1413
DODDS, S. J., and WALKER, A. B., Sliding-mode control system for the three-axis attitude control of rigid-body spacecraft with unknown dynamics parameters, 737

EISAKA, T., YANAGITA, Y., and TAGAWA, R., Design of a robust electrical position servo based on dual model matching, 497
EL-GEBEILY, M., and MOUSTAFA, K. A. F., Asymptotic analysis of almost periodic weakly non-linear systems, 561

FADALI, M. S., *see* Zohdy, M. A.
FENG, GANG, and PALANISWAMI, M., Unified treatment of internal model principle based adaptive control algorithms, 883
FLEMING, P. J., *see* de Oliveira, M. C. F.
FRAZHO, A. E., *see* Le, D. K.

GARDINER, J. D., and LAUB, A. J., Parallel algorithms for algebraic Riccati equations, 1317
GLOVER, K., *see* Iglesias, P. A.
GORDON, T. J., Infinite gain margins in non-linear regulators, 547
GRASSELLI, O. M., and LONGHI, S., Robust tracking and regulation of linear periodic discrete-time systems, 613
GRAY, J. O., *see* Janabi, T. H.
GREEN, R. J., *see* Baharin, I. B.
GREENE, C. D., and LEVY, B. C., Some new smoother implementations for discrete-time gaussian reciprocal processes, 1233
GU, K., *see* Zohdy, M. A.
GUNNARSSON, S., Frequency domain accuracy of recursively identified ARX models, 465

HAN, KUANG-WEI, *see* Tao, Chang-Shing
HARRISON, R. F., *see* Banks, S. P.
HEYMANN, M., *see* Willner, Y.
HIPPE, P., Design of observer-based compensators in the frequency domain: the discrete-time case, 705
HOPE, G. S., *see* Pahalawaththa, N. C.
HOROWITZ, I., OLDAK, S., and SHAPIRO, A., Extensions of dithered feedback systems, 83
HOWITT, G. D., and LUUS, R., Simultaneous stabilization of linear single-input systems by linear state feedback control, 1015

ICHIKAWA, AKIRA, Quadratic games and H_2-type problems for time varying systems, 1249
IGLESIAS, P. A., and GLOVER, K., State-space approach to discrete-time $\mathcal{H}_\infty$ control, 1031
IOANNOU, P. A., *see* Tao, Gang
IONESCU, D., *see* Lin, Jing-Yue
ITAMYIA, KEIETSU, *see* Shin, Seiichi
ITO, KAZUHO, and KUNIMATSU, NOBORU, Semigroup model and stability of the structurally damped Timoshenko beam with boundary inputs, 367

JANABI, T. H., and GRAY, J. O., Method for the control of a special class of non-linear systems, 215
JONCKHEERE, E. A., *see* Bar-on, J. R.

KAI, XIONG ZHONG, *see* Chen, Y. H.
KAILATH, T., *see* Chisci, L.
KAILATH, T., *see* Chun, J.
KASPARIAN, V., *see* Batur, C.
KISNER, R. A., *see* Raju, G. V. S.
KOUVARITAKIS, B., and CREWS, M., Uncertainty and interaction of linear multivariable feedback systems, 849
KUNIMATSU, NOBORU, *see* Ito, Kazuho

LAUB, A. J., *see* Gardiner, J. D.
LE, D. K., NWOKAH, O. D. I., and FRAZHO, A. E., Multivariable decentralized integral controllability, 481
LEE, B. K., CHEN, B. S., and LIN, Y. P., Extension of linear quadratic optimal control theory for mixed backgrounds, 943
LEE, BORE-KUEN, CHEN, BOR-SEN, and LIN, YU-PING, Model reference deadbeat control, 1217
LEITHEAD, W. E., and O'REILLY, J., Performance issues in the individual channel design of 2-input 2-output systems, 47
LEITHEAD, W. E., *see* O'Reilly, J.
LEITMANN, G., *see* Chen, Y. H.
LEMOS, J. M., MENDONÇA, T. F., and MOSCA, E., Long-range adaptive control with input constraints, 289
LEV-ARI, H., *see* Chisci, L.
LEVY, B. C., *see* Greene, C. D.
LEVY, B. C., *see* Nikoukhah, R.
LI, Y., NIESSEN, K., and ROGERS, E., Mapping systolic structures onto transputer/A100 based parallel processors for adaptive/self-tuning control, 1399
LIN, J., AMINI, Z., and ROBERTS, P. D., New coordination strategy for on-line hierarchical optimizing control of large scale industrial process, 1075
LIN, JING-YUE, and IONESCU, D., Asymptotic behaviour of output feedback for a class of non-deterministic discrete event systems, 903
LIN, Y.-P., *see* Lee, B. K.
LIN, YU-PING, *see* Lee, Bore-Kuen
LISCHINSKY-ARENAS, P., *see* Sira-Ramirez, H.
LIU, JING-SIN, and YUAN, KING, Characterization of allowable perturbations for robust decoupling of affine non-linear systems, 729
LONG, T. W., and CARRINGTON, C. K., A new non-linear optimal control method: the tracking and relative direction imbedded system, 417
LONGHI, S., *see* Grasselli, O. M.
LOOP, R. P. H., *see* Van Willigenburg, L. G.
LUUS, R., *see* Howitt, G. D.

MÄKILÄ, P. M., Identification of stabilizable systems: closed-loop approximation, 577
MÄKILÄ, P. M., Multiple models, multiplicative noise and linear quadratic control—algorithmic aspects, 921
MÄKILÄ, P. M., Robust identification and Galois sequences, 1189
MALIK, O. P., *see* Pahalawaththa, N. C.
MCAVOY, T. J., *see* Saint-Donat, J.
MENDONÇA, T. F., *see* Lemos, J. M.
MITOBE, KAZUHISA, and ADACHI, NORIHIKO, Hopf bifurcation in an adaptive d.c. servo system, 831
MOIR, T. J., *see* Dabis, H. S.
MORARI, M., *see* Zafiriou, E.
MÖRGUL, Ö., Boundary control of a Timoshenko beam attached to a rigid body: planar motion, 763
MOSCA, E., *see* Lemos, J. M.
MOUSTAFA, K. A. F., *see* El-Gebeily, M.

NGUYEN, D. H., and WIDROW, B., Neural networks for self-learning control systems, 1439
NIESSEN, K., *see* Li, Y.
NIKOUKHAH, R., WILLSKY, A. S., and LEVY, B. C., Reachability, observability, minimality, and extendibility for two-point boundary-value descriptor systems, 635
NWOKAH, O. D. I., *see* Le, D. K.
NYMAN, P.-O., Equalizer principle of $\mathscr{H}^\infty$-optimal control and its application to super-optimization, 393

O'REILLY, J., and LEITHEAD, W. E., Multivariable control by 'individual channel design', 1
O'REILLY, J., *see* Leithead, W. E.
OLDAK, S., *see* Horowitz, I.
ÖZBAY, H., Controller reduction in the two-block H^∞ optimal design for distributed plants, 1291

PAHALAWATHTHA, N. C., HOPE, G. S., and MALIK, O. P., MIMO self-tuning power system stabilizer, 815
PALANISWAMI, M., *see* Feng, Gang
PARTINGTON, J. R., Robust identification and interpolation in H_2, 1281
PERNG, MING-HWEI, Unified theory of impulse transmission, infinite zeros, and the unbounded asymptotic behaviour of MIMO systems, 307

RAJU, G. V. S., ZHOU, JUN, and KISNER, R. A., Hierarchical fuzzy control, 1201
ROBERTS, P. D. *see* Lin, J.
ROGERS, E., *see* Li, Y.

SAFONOV, M. G., *see* Wang, Weizheng
SAINT-DONAT, J., BHAT, N., and MCAVOY, T. J., Neural net based model predictive control, 1453

ŞEFIK, A., and SEZER, M. E., Pole assignment problem: a structural investigation, 973
SEZER, M. E., *see* Şefik, A.
SHAPIRO, A., *see* Horowitz, I.
SHIN, SEIICHI, ITAMYIA, KEIETSU, and ANDO, KAZUAKI, Practical hybrid adaptive control taking into consideration computational time, 279
SIRA-RAMIREZ, H., Non-linear discrete variable structure systems in quasi-sliding mode, 1171
SIRA-RAMIREZ, H., and LISCHINSKY-ARENAS, P., Differential algebraic approach in non-linear dynamical compensator design for d.c.-to-d.c. power converters, 111
SLOCK, D. T. M., *see* Chisci, L.
SOH, C. B., Robust discrete time systems using delta operators, 453
SUBRAHMANYAM, M. B., Necessary conditions for optimal disturbance rejection in linear systems, 999
SZNAIER, M., Comments on 'Robust optimal parametric LQ control with a guaranteed cost bound and applications', 1309

TAGAWA, R., *see* Eisaka, T.
TANTAWY, H. S., *see* Zohdy, M. A.
TAO, CHANG-SHING, CHANG, CHE-SHU, and HAN, KUANG-WEI, Gain margins and phase margins for multivariable control systems with adjustable parameters, 435
TAO, GANG, and IOANNOU, P. A., Robust adaptive control—a modified scheme, 241
TAO, Q. H., *see* Billings, S. A.
VAN WILLIGENBURG, L. G., and LOOP, R. P. H., Computation of time-optimal controls applied to rigid manipulators with friction, 1097

WALKER, A. B., *see* Dodds, S. J.
WANG, WEIZHENG, and SAFONOV, M. G., Relative-error bound for discrete balanced stochastic truncation, 593
WIDROW, B., *see* Nguyen, D. H.
WILLNER, Y., and HEYMANN, M., Supervisory control of concurrent discrete-event systems, 1143
WILLSKY, A. S., *see* Nikoukhah, R.

YANAGITA, Y., *see* Eisaka, T.
YEUNG, K. S., *see* Chen, Y. P.
YUAN, KING, *see* Liu, Jing-Sin

ZAFIRIOU, E., and MORARI, M., Internal mode control: robust digital controller synthesis for multivariable open-loop stable or unstable processes, 665
ZHANG, WEIJIAN, Frequency response of non-linearly damped flexible structures, 135
ZHOU, JUN, *see* Raju, G. V. S.
ZHU, Q. M., *see* Billings, S. A.
ZOHDY, M. A., GU, K., TANTAWY, H. S., and FADALI, M. S., Robust eigenstructure assignement for multi-input systems, 1273
ZOMAYA, A. Y., Efficient robot dynamics for high sampling rate motions: case studies and benchmarks, 793